

ABSTRAK

ANALISIS PENGARUH *CUTTING FLUID* DROMUS DAN MINYAK NABATI TERHADAP MATA PAHAT DALAM PROSES *DRILLING* METODE *MINIMUM QUANTITY LUBRICATION* (MQL)

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(2025: xv + 73 Halaman, 36 Gambar, 33 Tabel, 16 Lampiran)

Penelitian ini bertujuan untuk menganalisis pengaruh penggunaan dua jenis *Cutting Fluid*, yaitu Dromus dan Minyak Nabati, terhadap keausan dan suhu pada mata pahat dalam proses pengeboran (*Drilling*) besi cor FC25 menggunakan metode Minimum Quantity Lubrication (MQL). Metode MQL merupakan teknik pelumasan yang menggunakan volume fluida sangat minim, disemprotkan langsung ke zona pemotongan untuk mengurangi panas dan gesekan, serta lebih ramah lingkungan dibandingkan metode pendinginan konvensional. Dalam penelitian ini, sistem MQL dirancang dan diuji menggunakan pahat *High Speed Steel* (HSS) berdiameter 12 mm pada dua kecepatan putaran, yaitu 696,1 rpm dan 907,2 rpm. Hasil pengujian menunjukkan bahwa penggunaan Minyak Nabati mampu menurunkan suhu pemotongan dan mengurangi tingkat keausan mata pahat. Data keausan dianalisis melalui selisih massa sebelum dan sesudah pemotongan, sedangkan pengukuran suhu dilakukan menggunakan *thermocouple*. Analisis statistik Uji-T membuktikan bahwa terdapat perbedaan signifikan antara kedua jenis pelumas terhadap suhu dan kurang signifikan pada keausan. Minyak Nabati, dengan sifat pelumasan yang baik dan biodegradable, terbukti menjadi alternatif yang efisien dan ramah lingkungan dalam aplikasi MQL pada proses drilling. Penelitian ini memberikan kontribusi dalam pengembangan teknologi pemesinan berkelanjutan yang mendukung efisiensi biaya dan pelestarian lingkungan.

Kata Kunci : *Dromus*, *Drilling*, Keausan Pahat, Minyak Nabati, *Minimum Quantity Lubrication* (MQL), Suhu Pemotongan.

ABSTRACT

ANALYSIS OF THE USE OF THE MINIMUM QUANTITY LUBRICATION (MQL) METHOD IN THE DRILLING PROCESS WITH VEGETABLE OIL-BASED CUTTING FLUID

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This study aims to analyse the effect of using two types of cutting fluids, namely Dromus and vegetable oil, on wear and temperature in drill bits during the drilling process of FC25 cast iron using the Minimum Quantity Lubrication (MQL) method. The MQL method is a lubrication technique that uses a very minimal volume of fluid, sprayed directly into the cutting zone to reduce heat and friction, and is more environmentally friendly compared to conventional cooling methods. In this study, the MQL system was designed and tested using a 12 mm diameter High Speed Steel (HSS) drill bit at two rotational speeds, namely 696.1 rpm and 907.2 rpm. Test results showed that the use of vegetable oil could reduce cutting temperature and decrease tool wear rates. Wear data was analysed through the difference in mass before and after cutting, while temperature measurements were taken using a thermocouple. Statistical analysis using a T-test demonstrated significant differences between the two lubricant types in terms of temperature and less significant differences in wear. Vegetable oil, with its good lubricating properties and biodegradability, has proven to be an efficient and environmentally friendly alternative in MQL applications for drilling processes. This study contributes to the development of sustainable machining technology that supports cost efficiency and environmental conservation.

Keywords : Cutting Temperature, Drilling, Dromus, Minimum Quantity Lubrication (MQL), Tool Wear, Vegetable Oil.